

Marine Sediment Toxicity Testing

A list of species and tests included in this category may be found in the associated [QAPrPTTableReference](#).

Terms appearing in the tables are defined in the [Surface Water Ambient Monitoring Program Quality Assurance Program Plan](#), which contains a glossary (Appendix E), as well as a list of abbreviations and acronyms (Appendix F).

Table 1: Quality Control¹: Marine Sediment Toxicity Testing

| Negative Controls | Frequency of Analysis | Control Limits |
|--|--|--|
| Laboratory Control Water | Laboratory control water consistent with Section 7 of the appropriate EPA method/manual must be tested with each analytical batch. | Laboratory control water must meet all test acceptability criteria (please refer to Section 7 of the appropriate EPA method/manual) for the species of interest. |
| Conductivity/Salinity Control Water | A conductivity or salinity control must be tested when these parameters are above or below the species tolerance. | Follow EPA guidance on interpreting data and refer to tables below for tolerance ranges. |
| Additional Control Water | Additional method blanks are required whenever manipulations are performed on one or more of the ambient samples within each analytical batch (e.g., pH adjustments, continuous aeration). | There must be no statistical difference between the laboratory control water and each additional control water within an analytical batch. |
| Sediment Control | Sediment control consistent with Section 7 of the appropriate EPA method/manual must be tested with each analytical batch of sediment toxicity tests. | Sediment control must meet all data acceptability criteria (please refer to Section 7 of the appropriate EPA method/manual) for the species of interest. |
| Positive Controls | Frequency of Analysis | Control Limits |
| Reference Toxicant Tests | Reference toxicant tests must be conducted monthly for species that are raised within a laboratory, or per analytical batch for commercially-supplied or field-collected species. | Last plotted data point (LC50 or EC50) must be within 2 SD of the cumulative mean (n=20). Reference toxicant tests that fall outside of recommended control chart limits are evaluated to determine the validity of associated tests. An out of control reference toxicant test result does not necessarily invalidate associated test results. More frequent and/or concurrent reference toxicant testing may be advantageous if recent problems have been identified in testing. |

¹Unless method specifies more stringent requirements.

In special cases where the criteria listed in the above tables cannot be met, EPA minimum criteria may be followed. The affected data should be flagged accordingly.

Test data are reviewed to verify that the test acceptability criteria for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests should be repeated with the newly collected sample. If this is not possible, the test should be repeated with an archived sample and all tests must be properly flagged.

Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Depending on the degree of the departure and the objective of the test, deviations from recommended conditions may or may not invalidate a test result. Before rejecting or accepting a test result as valid, the reviewer should consider the degree of the deviation and the potential or observed impact of the deviation on the test result. For example, if dissolved oxygen is measured below 4.0 mg/L in one test chamber, the reviewer should consider whether any observed mortality in that test chamber corresponded with the drop in dissolved oxygen.

Table 1: Quality Control¹: Marine Sediment Toxicity Testing (continued)

| Field Quality Control | Frequency of Analysis | Control Limits |
|-------------------------|----------------------------------|---|
| Sample Duplicate | 5% of total project sample count | Recommended acceptable RPD<20% |
| Field Blanks | Based on project requirements | No statistical difference between the laboratory control water (or sediment control) and the field blank within an analytical batch |
| Bottle Blanks | Based on project requirements | No statistical difference between the laboratory control water and the equipment blank within an analytical batch |

¹Unless method specifies more stringent requirements.

In special cases where the criteria listed in the above tables cannot be met, EPA minimum criteria may be followed. The affected data should be flagged accordingly.

Test data are reviewed to verify that the test acceptability criteria for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests should be repeated with the newly collected sample. If this is not possible, the test should be repeated with an archived sample and all tests must be properly flagged.

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Table 2: Corrective Action: Toxicity Testing in Water (General) Marine Sediment Toxicity Testing

| Negative Controls | Corrective Action |
|--|--|
| Laboratory Control Water | If tested with in-house cultures, affected samples and associated quality control must be retested within 24 hours of test failure. If commercial cultures are used, they must be ordered within 16 hours of test failure for the earliest possible receipt. Retests must be initiated within 30 hours of receipt, depending on the need for organism acclimation. The laboratory should try to determine the source of the control failure, document the investigation, and document the steps taken to prevent a recurrence. |
| Conductivity/Salinity Control Water | Affected samples and associated quality control must be flagged. |
| Additional Control Water | Based on the objectives of the study, a water sample that has similar qualities to the test sample may be used as an additional control. Results that show statistical differences from the laboratory control should be flagged. The laboratory should try to determine the source of variation, document the investigation, and document the steps taken to prevent a recurrence. This is not applicable for TIE method blanks. |
| Sediment Control | Based on the objectives of the study, a sediment sample that has similar qualities to the test sample may be used as an additional control. Results that show statistical differences from the laboratory control should be flagged. The laboratory should try to determine the source of variation, document the investigation, and document the steps taken to prevent a recurrence. |
| Positive Controls | Corrective Action |
| Reference Toxicant Tests | If the LC50 exceeds +/- two standard deviations of the running mean of the last 20 reference toxicant tests, the test should be flagged. |
| Field Quality Control | Corrective Action |
| Field Duplicate | For duplicates with a heterogeneous matrix, results that do not meet SWAMP criteria should be flagged. The project coordinator should be notified so that the sampling team can identify the source of variation and perform corrective action prior to the next sampling event. |
| Field Blanks | If contamination of the field blanks and associated samples is known or suspected, the laboratory should flag the affected data. The project coordinator should be notified so that the sampling team can identify the contamination source(s) and perform corrective action prior to the next sampling event. |
| Equipment Blanks | If contamination of the field blanks and associated samples is known or suspected, the laboratory should flag the affected data. The project coordinator should be notified so that the sampling team can identify the contamination source(s) and perform corrective action prior to the next sampling event. |

Table 3: Marine Sediment Testing: 10-Day Survival *Ampelisca abdita* Sediment Toxicity Test

| Method Recommendation≥ | |
|---|--|
| EPA/600/R-94/025 or validated and SWAMP-approved alternative method | |
| Data Acceptability Requirements | |
| Parameter | Criteria |
| Test Acceptability Criteria ¹ | ≥90% survival in the controls |
| Data Qualification | |
| Test Conditions | Required |
| Test Type | Whole sediment, static |
| Size at Test Initiation | 3 – 5 mm (no mature males or females) |
| Replication at Test Initiation | 4 (minimum) |
| Organisms/Replicate | 20 (minimum) |
| Food Source | Do not feed |
| Renewal Frequency | None |
| Test Duration | 10 days |
| Endpoints | Survival |
| Test Conditions | Recommended ² |
| Salinity | 28 ± 2‰ |
| Temperature Range | 20 ± 1.5 °C (±3 °C required) |
| Light Intensity | 10 – 20 µE/m ² /s or 50 – 100 ft-c |
| Photoperiod | Continuous luminance |
| Test Chamber Size | 1 L |
| Replicate Volume | Sediment volume 175 mL (~2 cm); overlying water volume 800 mL |
| Feeding Regime | Do not feed |
| Laboratory Control Water | Clean natural seawater or reconstituted water |
| Sediment Control | Clean sediment from organism collection site (sieved through 500 µm screen) |
| Minimum Sample Volume | 3 L for one-time grab sample |
| Sensitivity | Performance Criteria |
| Reference Toxicant Testing | See Table 2 |
| Water Chemistry | |
| Test Parameter | Required Frequency |
| Initial Overlying Water Chemistry | One DO, pH, salinity, ammonia, and temperature measurement per sample |
| Initial Interstitial Water Chemistry | One pH, ammonia, and salinity measurement per sample |
| Daily Water Chemistry | One temperature measurement per sample |
| Final Overlying Water Chemistry | One DO, pH, salinity, ammonia, and temperature measurement per sample |
| Final Interstitial Water Chemistry | One pH, ammonia, and salinity measurement per sample |
| Test Parameter | Recommended Criteria |
| Initial DO Range | 90 - 100% saturation |
| Sample Handling/Collection | |
| Test Parameter | Recommended Conditions |
| Relevant Media | Sediment |
| Sample Container Type | Amber glass recommended, but clear glass or plastic (polyethylene or polycarbonate) acceptable |
| Sample Preservation | Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times |
| Sample Receipt Temperature | 0 - 6 °C |
| Holding Time | <14 days (recommended) or <8 weeks (required) @ 0 - 6 °C; dark; do not freeze |

¹Test data are reviewed to verify that test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting these criteria is considered invalid. All invalid tests must be repeated with a newly collected sample.

²Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Depending on the degree of the departure and the objective of the test, deviations from recommended conditions may or may not invalidate a test result.

Table 4: Marine Sediment Testing: 10-Day Survival *Eohaustorius estuarius* Sediment Toxicity Test

| Method Recommendation | |
|---|---|
| EPA/600/R-94/025 or validated and SWAMP-approved alternative method | |
| Data Acceptability Requirements | |
| Parameter | Criteria |
| Test Acceptability Criteria ¹ | ≥90% survival in controls |
| Data Qualification | |
| Test Conditions | Required |
| Test Type | Whole sediment, static |
| Size at Test Initiation | 3 – 5 mm (no mature males or females) |
| Replication at Test Initiation | 4 (minimum) |
| Organisms/Replicate | 20 (minimum) |
| Food Source | Do not feed |
| Renewal Frequency | None |
| Test Duration | 10 days |
| Endpoints | Survival |
| Test Conditions | Recommended ² |
| Salinity | 20-34 ± 2‰ |
| Temperature Range | 15 ± 1.0 °C (±3 °C required) |
| Light Intensity | 10 – 20 µE/m ² /s or 50 – 100 ft-c |
| Photoperiod | Continuous luminance |
| Test Chamber Size | 1 L |
| Replicate Volume | Sediment volume 175 mL (~2 cm); Overlying water volume 800 mL |
| Feeding Regime | Do not feed |
| Laboratory Control Water | Clean natural seawater or reconstituted water |
| Sediment Control | Clean sediment from organism collection site (sieved through 500 µm screen) |
| Minimum Sample Volume | 3L for one-time grab sample |
| Sensitivity | Performance Criteria |
| Reference Toxicant Testing | See Table 2 |
| Water Chemistry | |
| Test Parameter | Required Frequency |
| Initial Overlying Water Chemistry | One DO, pH, salinity, ammonia, and temperature measurement per sample |
| Initial Interstitial Water Chemistry | One pH, ammonia, and salinity measurement per sample |
| Daily Water Chemistry | One temperature measurement per sample |
| Final Overlying Water Chemistry | One DO, pH, salinity, ammonia, and temperature measurement per sample |
| Final Interstitial Water Chemistry | One pH, ammonia, and salinity measurement per sample |
| Test Parameter | Recommended Criteria |
| Initial DO Range | 90 - 100% Saturation |
| Sample Handling/Collection | |
| Test Parameter | Recommended Conditions |
| Relevant Media | Sediment |
| Sample Container Type | Amber glass recommended but clear glass or plastic (polyethylene or polycarbonate) acceptable |
| Sample Preservation | Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times |
| Sample Receipt Temperature | 0 - 6 °C |
| Holding Time | <14 days (recommended) or <8 weeks (required) @ 0 - 6 °C; dark; Do not freeze |

¹Test data are reviewed to verify that test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting these criteria is considered invalid. All invalid tests must be repeated with a newly collected sample.

²Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Depending on the degree of the departure and the objective of the test, deviations from recommended conditions may or may not invalidate a test result.